

IO'S MID-IR VOLCANIC THERMAL EMISSION DURING 1998. J.D. Goguen, G.J. Veeder, D.L. Blaney, D.L. Matson, and T.V. Johnson, JPL, MS 183-501, 4800 Oak Grove Dr., Pasadena CA 91109, USA, (jdg@scn1.jpl.nasa.gov).

The figure on the following page shows the rotational variation in Io's disk-integrated thermal emission at 4.8, 8.7 and 20 μ m during 4 observing runs at the NASA IRTF between June and November 1998. The reduction of these data and their presentation follow the procedures detailed in Veeder et al. (1994). Specifically, the 4.8 μ m data shown have the reflected sunlight component subtracted providing an estimate the component of the flux due to volcanic thermal emission alone. The series of lines against which the 1998 data are plotted summarize the variation of Io's emission over a decade, as reported Veeder et al. (1994). The low points near 10 W longitude in the November data are measurements of Io in-eclipse.

The wavelengths, times and global coverage of this data set complement other observations during this period from the Galileo GEM mission, HST Nicmos, the near-IR and mid-IR Jupiter occultation and in-eclipse measurements by IJW participants at Lowell (Spencer et al., 1998), U. Wyoming (Howell, 1998), and adaptive optics imaging and speckle observations at Keck (Macintosh et al., 1998) and CFHT (Dumas et al., 1998). Many of these very recent data sets that paint a picture of Io's recent volcanic activity with unprecedented coverage are previewed on the International Jupiter Watch Satellites Discipline web site (see References for the corresponding URLs).

The strongest source of thermal emission at mid-IR wavelengths is Loki, which produces the prominent maximum near 310 W longitude at 8.7 μ m. Loki's 3.4 μ m flux doubled near the end of May 1998 (Spencer et al., 1998) just prior to our first observations in early June and Loki has remained bright in the near-IR through the end of 1998. The 4.8 μ m flux at this longitude is near the maximum of the historical variation in the July, September and November radiometry. This is the longest continuous brightening of Loki observed to date.

The clear result that the 8.7 μ m Loki flux remains nearly constant during the July-November period is curious. Howell's (1997) model for the thermal emission from lava flows, which reproduces the Voyager IRIS Loki spectrum, predicts that the 8.7 μ m flux should increase monotonically as the cooling flows accumulate. One way to maintain a constant 8.7 μ m flux is to continuously "remove" flows older than some maximum age. For example, a lava lake which, when full, drains through subsurface lava tubes, could produce a steady-state emission spectrum.

HST NICMOS images acquired on 7/19/98 (Goguen et al., 1998) and 11/22/98 UT show that there are at least a dozen active eruptions on Io's Jupiter-facing hemisphere during this period. We will discuss our mid-IR results in the context of these and the suite of other available observations.

The 4.8 and 8.7 μ m lightcurves show that the mid-IR thermal emission from Io's leading hemisphere, where the coverage of the Galileo and GEM observations is best, is much less than that from its trailing hemisphere. There is evidence at 4.8 μ m that a significant eruption was active in September near 90 W longitude, but its signature had faded by November.

References

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- IJW SDI = URL <http://www.lowell.edu/users/ijw/images.html>
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